WHAT IS CLAIMED IS:

1. A method for high-speed transmission of information data on an optical channel, the method comprising:

encoding information via a trellis encoder to produce digital multilevel symbols;

converting the digital multilevel symbols into analog multilevel signals; and

transmitting the analog multilevel symbols over an optical channel.

2. The method of claim 1 further comprising equalizing the digital multilevel symbols to compensate for characteristics of the optical channel.

3. The method of claim 1 further comprising of equalizing the analog multilevel symbols to compensate for characteristics of the optical channel.

4. The method of claim 2 wherein equalizing the digital multilevel symbols comprises precoding the digital multilevel symbols using a Tomlinson Harashima precoder.

5. The method of claim 2 wherein the equalizing the digital multilevel symbols comprises precoding the digital multilevel symbols using a dynamic limiting precoder.

6. The method of claim 1 wherein the converting the digital multilevel symbols to analog multilevel symbols includes mapping the digital multilevel symbols into a subset mapper.

7. The method of claim 1 wherein transmitting the analog multilevel symbols over an optical channel comprises modulating the intensity of a light source according to the level of the analog multilevel symbols.

8. The method of claim 1 wherein transmitting the analog multilevel symbols over an optical channel comprises modulating laser intensity according to a level of the analog multilevel symbols.

9. A method as in claim 2 wherein equalizing the digital multilevel symbols to compensate for the laser and channel characteristics comprises:

characterizing the channel; and

applying an inverse characterization of the channel to the digital multilevel symbols.

10. A method as in claim 2 wherein equalizing the digital multilevel symbols to compensate for the laser and channel characteristics comprises:

characterizing the channel; and

applying an inverse characterization of the channel to the analog multilevel symbols.

11. A method for high speed transmission on an optical channel, the method comprising:

accepting information from a plurality of sources;

encoding the information via a plurality of trellis encoders to produce a plurality of digital multilevel symbols;

converting the plurality of digital multilevel symbols into a plurality of analog multilevel signals; and

transmitting the analog multilevel signal by time division multiplexing the plurality of analog multilevel signals onto an optical channel.

12. A method as in claim 11 wherein converting the plurality of digital multilevel symbols to analog multilevel signals further comprises:

mapping the digital multilevel symbols in a subset mapper; and

forming analog multilevel symbols by providing analog representations of mapped multilevel signals.

13. The method of claim 11 further comprising equalizing the plurality of digital multilevel symbols to compensate for characteristics of the optical channel.

14. The method of claim 11 further comprising equalizing the plurality of analog multilevel symbols to compensate for characteristics of the optical channel.

15. The method of claim 13 wherein equalizing the digital multilevel symbols comprises precoding the plurality of digital multilevel symbols using a Tomlinson Harashima precoder.

16. The method of claim 12 wherein equalizing the digital multilevel symbols comprises precoding the plurality of digital multilevel symbols using a dynamic limiting precoder.

17. The method of claim 11 wherein converting the plurality of digital multilevel symbols into a plurality of analog multilevel symbols further comprises:

accepting the plurality digital multilevel symbols into a subset mapper; and

forming a plurality of mapped analog multilevel symbols from the plurality of digital multilevel symbols.

18. The method of claim 11 wherein transmitting the plurality of analog multilevel symbols over an optical channel comprises modulating the intensity of a light source according to the levels of the plurality of analog multilevel symbols.

19. The method of claim 11 wherein transmitting the plurality of analog multilevel symbols over an optical channel comprises modulating the intensity of a laser according to the level of the analog multilevel symbols.

20. The method as in claim 12 wherein equalizing the digital multilevel symbols to compensate for the laser and channel characteristics comprises:

characterizing the channel; and

applying an inverse characterization of the channel to the digital multilevel symbols.

21. The method as in claim 12 wherein equalizing the digital multilevel symbols to compensate for the laser and channel characteristics comprises:

characterizing the channel; and

applying an inverse characterization of the channel to the plurality of analog multilevel symbols.

22. The method as in claim 11 wherein converting the plurality of digital multilevel symbols into a plurality of analog multilevel signals comprises:

accepting the plurality digital multilevel symbols successively into a single analog to digital converter; and

successively converting the plurality of symbols into analog multilevel symbols.

23. The method as in claim 11 wherein converting the plurality of digital multilevel symbols into a plurality of analog multilevel signals comprises:

accepting the digital multilevel symbols successively into a plurality of analog to digital converters;

converting the plurality of symbols into an analog representation; and

successively combining the analog multilevel symbols into a succession of analog multilevel symbols.

24. A method of receiving data from an optical channel the method comprising:

accepting a multilevel signal from the channel into an optical to electrical converter;

converting the multilevel signal into an analog electrical signal;

converting the analog electrical signal into a digital signal; and

decoding the digital signal in a trellis decoder.

25. The method of claim 24 further comprising equalizing the digital signal prior to decoding the digital signal in the trellis decoder.

26. The method of claim 25 wherein equalizing the digital signal comprises applying a decision feedback equalization to the digital signal.

27. A method as in claim 24 wherein converting the analog electrical signal to a digital signal comprises:

successively sampling the analog electrical signal; and

converting the successive samplings into a plurality of parallel digital values.

28. A method of signaling over an optical channel the method comprising:
accepting data from a source;
trellis encoding the data;
coupling the encoded data into an optical channel;
conveying the data over the optical channel;
accepting data from the optical channel
decoding the data accepted from the optical channel; and
providing the decoded data to an interface.

29. A method as in claim 28 further comprising:
equalizing the data after trellis encoding the data.

30. A method as in claim 29 wherein equalizing the data comprises applying a Tomlinson-Harashima precoding to the data.

31. A method as in claim 30 wherein equalizing the data comprises applying a dynamic limited precoding.

32. An apparatus for transmitting information on an optical channel to apparatus comprising:
a trellis encoder for accepting digital information and producing digital multilevel signals;
a digital to analog converter that accepts the digital multilevel signals and produces analog multilevel signals; and
an analog signal to optical converter that converts the analog signal to an optical level for coupling into an optical channel.

33. The apparatus of claim 32 further comprising an equalizer that accepts the digital multilevel signals and produces equalized digital multilevel signals prior to coupling into the digital to analog.

34. The apparatus of claim 32 further comprising an equalizer that accepts the analog multilevel signals and produces equalized analog multilevel signals.

35. An apparatus as in claim 33 wherein the equalizer is a Tomlinson-Harashima precoder.

36. An apparatus as in claim 33 wherein the equalizer is a dynamic limiting precoder.

37. An apparatus as in claim 32 wherein the analog signal to optical level converter includes a laser.

38. An apparatus for concurrently transmitting a plurality of data signals over an optical channel, the apparatus comprising:

a plurality of trellis encoders that accept a plurality of data signals and produce a plurality of digital multilevel signals;

a converter that accepts a plurality of digital multilevel signals and produce a plurality of analog multilevel signals;

an optical source that receives the plurality of analog multilevel signals and produces a light output proportional to the level of successive analog multilevel signals for driving an optical channel.

39. An apparatus as in claim 38 further comprising a plurality of equalizers that accept the plurality of digital multilevel signals and produce a plurality of equalized digital multilevel signals to provide to the converter.

40. An apparatus as in claim 39 wherein the plurality of equalizers comprise a plurality of Tomlinson-Harashima precoders.

41. An apparatus as in claim 39 wherein the plurality of equalizers comprise a plurality of dynamic limiting precoders.

42. An apparatus for concurrently transmitting a plurality of data signals over an optical channel the apparatus comprising:

a plurality of trellis encoders that accept a plurality of data signals and produce a plurality of digital multilevel signals;

an analog to digital converter that sequentially accepts the plurality of digital multilevel signals and produces a plurality of sequential analog multilevel signals;

an optical source that receives the plurality of analog multilevel signals for driving an optical channel.

43. An apparatus as in claim 38 further comprising a plurality of equalizers that accept the plurality of digital multilevel signals and produce a plurality of digital multilevel signals.

44. An apparatus as in claim 43 wherein the plurality of equalizers comprise a plurality of Tomlinson-Harashima precoders.

45. An apparatus as in claim 43 wherein the plurality of equalizers comprise a plurality of dynamic limiting precoders.

46. An apparatus for receiving data from an optical channel the apparatus comprising:

an optical to electrical converter for receiving an optical multilevel signal from an optical channel and converting the optical multilevel signal into an analog multilevel electrical signal;

a decoder that accepts the analog multilevel electrical signal and converts it into digital multilevel signal;

a trellis decoder that accepts and decodes the digital multilevel signal producing data.

47. The apparatus of claim 46 further comprising an equalizer for accepting the digital multilevel signal and producing a digital equalized multilevel signal for coupling into the trellis decoder.

48. An apparatus as in 47 wherein the equalizer is a decision feedback equalizer.